

Douglas-fir Tussock Moth and Western Spruce Budworm Infestation

Status and Treatment

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What Constitutes a Healthy Forest?

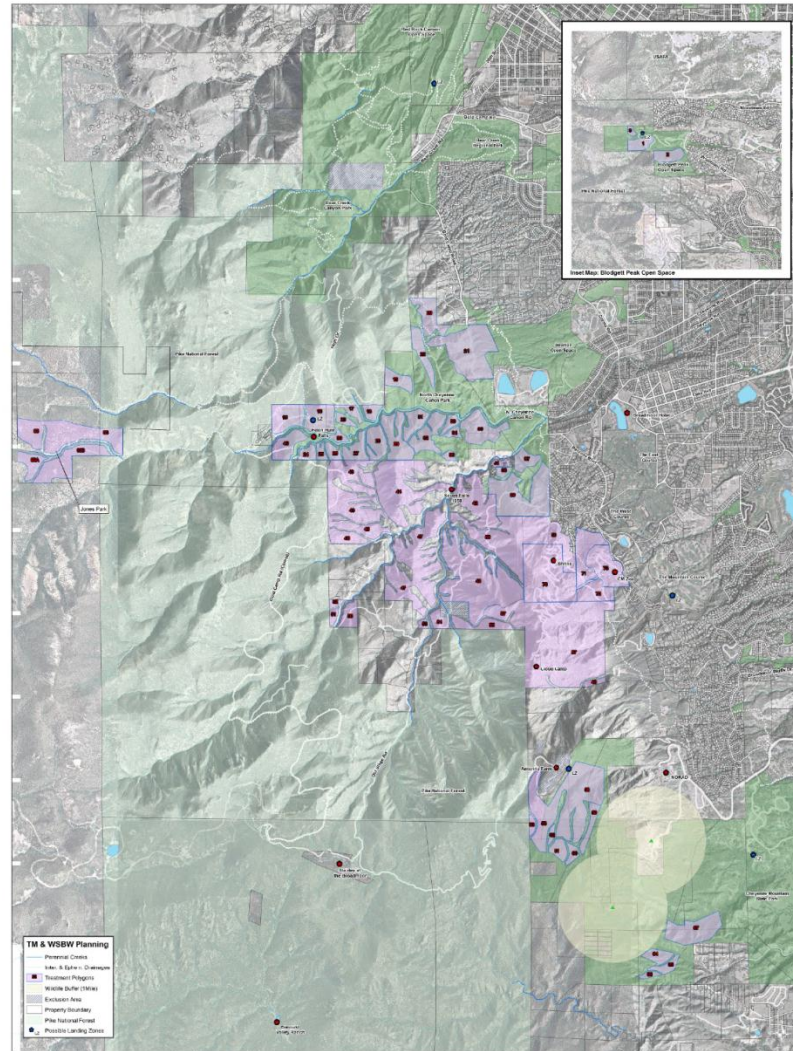
- Species diversity - including flora, fauna & invertebrates
- Mixed age classes
- Mixed size classes
- Proper stand stocking
- Great carbon sequestration
- Genetic variation
- Presence of Mosaics
- Regularity of disturbance events

Remember: there is no good or bad in Nature – it just is...









Tussock Moth & Western Spruce Budworm 2015 Outbreak
DRAFT Treatment Map - 07 MAR 2016

Historical Perspective

- Outbreaks have been documented since the 1930's
- The first large-scale, wildland forest outbreak since the 30's occurred between 1993-1996 in the South Platte River drainage on Pike NF
 - 30-40% mortality of approx. 18,000 acres
- The most recent epidemic occurred from 2004-08 along the Rampart Range
 - Pocket mortality – not widespread across entire drainages

Host Trees

White fir, Douglas-fir and Colorado Blue Spruce



Egg masses

- Tussock moth
- Western spruce budworm



Initial Damage

- Tussock moth
- Western spruce budworm



Needle Damage

- Tussock moth
- Western spruce budworm



Larvae

- Tussock moth
- Western spruce budworm



Top Down Defoliation

- Tussock moth
- Western spruce budworm



Whole Tree Damage

- Tussock moth
- Western spruce budworm



Landscape Scale - Valley Park, Larkspur



Pupal Chambers

- Tussock moth
- Western spruce budworm



Adult Moths

- Tussock Moth
- Western Spruce Budworm



Will the Trees Survive?



The Consequences of Doing Nothing:

- Size and severity of damage may increase over time
- Repetitive and complete defoliation can lead to opportunistic bark beetles and tree mortality
- Removal of protective canopy creates water quality/quantity issues
- Can lead to short term fuel hazards, wildlife/ zoo habitat loss, soil erosion, replacement of tree canopy with other cover types (shrubs, grasses, wildflowers...)
- Epidemic runs out of food sources
- Biotic agents catch up to host moths

What is *Bacillus thuringiensis* (Bt)?

- A naturally occurring soil bacterium discovered in 1901 by Shigetane Ishiwatari in Japan
- First used as a pesticide by farmers in 1920
- Used later in France as a control for flour moth in 1938
- In the US, Bt was used commercially starting in 1958. By 1961, Bt was registered as a pesticide with the EPA.
- Now used worldwide as a biocide that targets a very narrow range of insects, in our case tussock moth and western spruce budworm

How Does Bt Work?

- Application rate equals $\frac{1}{2}$ gallon per acre
- Must be ingested by the host moth
- Digestive acids alter Bt crystals that form endotoxins which attach to the gut lining
- This ruptures the cell walls
- Allows bacterium to germinate in the body cavity
- Paralysis ensues, moths stop feeding
- After about 5 days septicemia eventually causes death of host moth

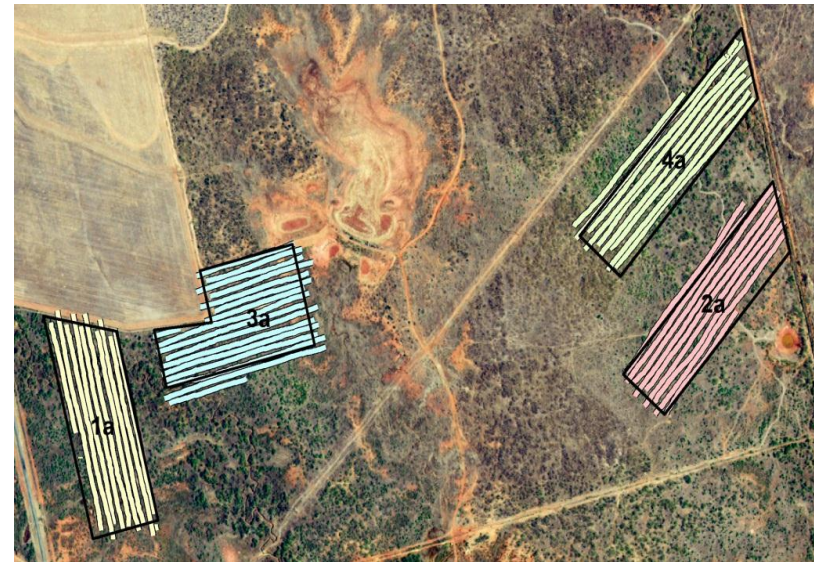
Helicopter Application



Apparatus



Landing Zone and GPS Mapping



What's Next?

- Development of aerial treatment logistics
- Spring bud-break
- Spray ops early to mid-June
- City tussock moth web page:
<https://parks.coloradosprings.gov/tussock>

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